

Mathematical Modeling - 41657 - MATH 365 - 001 Spring 2018 Wubben 112 9:30 - 10:45 am TR

Instructor: Dr. Phil Gustafson
Office: Wubben 134G
Phone: 248-1176
Email: pgustafs@coloradomesa.edu
Office Hours: 10:45 am – 12 noon Tues & Thurs
Appointments are also available (24 hours advanced notice recommended).

Course Description: In this course we will investigate various ways of developing mathematical descriptions of phenomena arising from real-world problems. A model in everyday life is usually thought of as a miniature representation of something; a pattern of something to be made; an example for imitation or emulation; a description or analogy used to help visualize something, etc. Similarly, a mathematical model is an idealized representation of a real-world phenomenon for the purpose of understanding and providing insight, and making predictions regarding its behavior. The modeling process is similar to, but not the same as, the scientific method, which seeks to confirm or deny a hypothesis using carefully conducted experimental methods. There can be many different models for a given phenomenon, each with its own set of advantages and disadvantages (which a modeler will clarify and discuss as part of the model). In this course we will cover model construction, model fitting, empirical modeling, discrete dynamical systems, simulation modeling and linear optimization models.

Text: Mathematical modeling is a vast subject area whose methodologies vary considerably. To customize our exposure to modeling, will use various resources for our course, much of to be provided in class. Additionally, models often incorporate data, which can be conveniently studied using spreadsheet software such as Excel. To facilitate this, we will use *Mathematical Modeling with Excel*, Brian Albright (Jones & Bartlett, 2010).

Student Learning Objectives: The student learning outcomes for this course are to develop the following:

- Independent learning skills, in particular, reading skills
- Problem-solving skills
- Communication skills
- Mathematical language skills
- Persistence, skill in exploration, conjecture, generalization
- Appreciate necessity for rigor and precision in mathematics
- Develop skills to implement and use technology, and to understand its limitations
- Acquire mathematics background relevant to other subjects
- Develop a broad general understanding of mathematics

Prerequisite: STAT 200, MATH 152/136, and one of the following: MATH 236, 240, 253, 325, or consent of instructor.

Required: Access to a computer with a word processor (typically Word), internet, and Excel.

Credit Hours Policy: An undergraduate student should expect to spend on this course a minimum of two hours outside of the classroom for every hour in the classroom; see the CMU *Curriculum Policies and Procedures Manual*.

Grading: The following categories determine your grade:

- Class Preps.....5%
- Attendance & Participation.....10%
- Modeling Perspectives Activities.....10%
- Homework.....20%
- Quizzes.....30%
- Projects.....15%
- Final Project.....10%
- Total.....100%

Grading Scale:

- 90 - 100 %..... A
- 80 - 89%..... B
- 70 - 79%..... C
- 60 - 69%..... D
- 0 - 59%..... F

Class Preps: A short assignment will often be due before class meets. These assignments require that you make basic contact with the reading material before we cover it in class.

Attendance & Participation: Classroom time will be used to introduce models, develop modeling techniques, gather data, collaborate with classmates, and learn Excel skills. Your attendance for this class will therefore be important. See Attendance, Course Participation, and Academic Behavior statements in this document for further information on the role of attendance and class conduct in this course.

Modeling Perspectives Activities: In this course we look beyond the classroom to develop our modeling perspective. You will earn points this semester by engaging in approved external modeling perspective activities. A partial list of ideas is given below, and you are invited to propose additional activities for approval.

- Discuss current events article
 - Attend and discuss relevant campus seminars.
 - Interview director & describe formal modeling activity for some on or off-campus group (CMU, BLM, Colorado Parks & Wildlife, local company, etc).
 - Station Volunteer for Math Extravaganza
 - Prepare resume, attend Career Fair & interview three relevant vendors.
 - Attend Student Showcase & review two relevant posters.
- Each activity will be accompanied by a short written summary and a brief presentation to the class.

Homework: Written homework will be assigned regularly. Some assignments may replace in-class coverage of a chapter section to enable activities and projects.

Projects: Individual and group projects involving various aspects of modeling will be assigned throughout the semester. These projects will typically require a typewritten component and/or a presentation to the class.

Quizzes: There will be five regular semester quizzes. The lowest quiz score will be dropped (instead of make-ups). The quiz dates are listed on the course calendar given below. Work, travel, vacation or any other non-college sanctioned activity is not an acceptable excuse for missing a quiz.

Final Project: This will be a larger project building on techniques developed during the semester, and will include a typewritten component and a presentation component.

Group Work: Real-world modelers usually work as part of a team or group. These groups typically consist of other professionals who often do not have the same background. For this course, some of the work assigned will be completed individually while other assignments will be completed in small groups. Ground rules for group work are listed below.

- 1) Groups must be approved by instructor in advance.
- 2) The goal of a project is for all students in the group to learn the concepts and methods.
- 3) Working in a group may or may not save each group member time in completing the project. Rather, it may help each group learn valuable concepts and skills.
- 4) Group members must agree on common times to meet. Attendance at all meetings is required. Meeting times and attendance should be recorded and may be requested by the instructor.
- 5) Before each meeting, each group member must do their homework for the meeting in order to be a contributing member of the group.
- 6) Group interactions should always be conducted in a professional and respectful manner.
- 7) If a group member has a particular task to perform for the group, then they must be sure to thoroughly explain their work to the other members of their group.
- 8) Attendance in class is also important for group work, since in-class discussions, both planned and unplanned, have direct bearing on the course assignments.

Cell Phone Policy: At the beginning of class cell phones (and all other portable technology devices) must be silenced and put away out of reach, such as in a backpack rather than placed in a clothing pocket. In-class image and video capture is not allowed except in unusual circumstances and permission must be obtained in advance. A few friendly reminders to put your phone away may be granted early in the semester, but for persistent violators each observed unapproved instance of a cell phone or technology violation will result in a 1 point deduction from their semester total (see Course Participation below), with additional consequences possible (see Academic Behavior below). Furthermore, during quizzes and exams, cell phone violations will be interpreted as acts of academic dishonesty.



Attendance: Daily attendance in class is crucial for your learning in this course. If you miss class, it is your responsibility to make up what was covered. I may follow the statement on attendance in the Maverick Guide, as part of the CMU Student Code of Conduct found online, which enables the instructor to initiate a drop or withdrawal for any student who fails to attend regularly. Read this attendance statement in your catalog carefully.

Course Participation: Course participation includes coming to class a few minutes early, being prepared for class, asking questions, participating in discussions and activities, and seeking help outside of class when appropriate. If you frequently do not come to class on time, are not prepared, and your participation detracts from the class (including unapproved cell phone and laptop use), then this will adversely affect your grade. Similarly, when you seek help during office hours, bring specific questions along with the work that you have attempted.

Academic Behavior: The overall goals of this class and of the college are for you to learn, to learn how to learn, and to pick up skills needed to be successful in life. Learning in the classroom requires an environment in which each student feels comfortable listening, thinking, concentrating, focusing, and asking questions. When you choose to attend class, you are agreeing to behave in such a way as to not disrupt the learning process of others. Otherwise, you jeopardize your enrollment in the class. So come to class prepared, interested in learning, and respectful of others. See the above paragraph on Course Participation for more guidelines on appropriate behavior in the classroom, and also in the CMU Student Code of Conduct found online.

Academic Dishonesty: Cheating is serious offense and will be treated as such. Cheating is an act of academic dishonesty, which includes using another person's work as though it was your own or knowingly permitting another student to use your work. The consequences of cheating on an assignment or quiz may result in the grade of 0 for all those involved, or in the case of an exam, an F for the course. These penalty scores are not subject to low-grade policies outlined earlier. Other situations involving cheating will be dealt with in a similar way. Further actions may be taken in accordance with the statement on academic dishonesty given in the CMU Student Code of Conduct found online.

Tutorial Learning Center (TLC) The TLC is a FREE academic service for all CMU students. Tutors are available on a walk-in basis for many courses. Located in Houston Hall 113, the TLC is open Monday - Thursday from 8am-6pm; Fridays from 8am-5pm, and Sundays from 1pm-6pm. Check out the website at www.coloradomesa.edu/tutoring or call 248-1392 with any questions.

Educational Access Services (EAS): In coordination with Educational Access Services, reasonable accommodations will be provided for qualified students with disabilities. Students must register with the EAS office to receive assistance. Please meet with the instructor the first week of class for information and/or contact Dana VandeBurgt, the Coordinator of Educational Access Services, directly by phone at 248-1801, or in person in Houston Hall, Suite 108.

Changes: The instructor reserves the right to make changes to this syllabus. Any changes will be announced in class.

Course Topics and Coverage

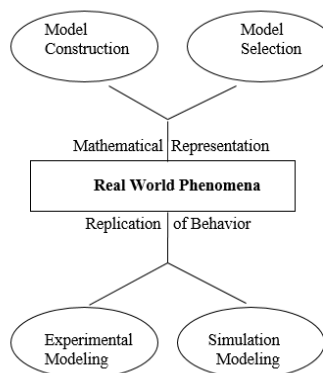
The table below lists the main topics to be covered in this course along with an approximate number of classes devoted to the topic areas. The timeline is subject to minor adjustments as we progress through the material.

Course Topics	Approx Timeline
Basics of Mathematical Modeling This portion of the course lays the foundation for much of what we do in the course, including: Discussion of Syllabus and Semester Overview, Discussion of Modeling Philosophy, Introduction to Basic Methods and Model Types, Learning How to Use Excel for Analysis and Model Development, Using Word and Excel for Report Writing; Critiquing Models and Model Reports, Identifying Specific and Measurable Problem Statements from Vague Real-World Scenarios, Modeling in Current Events and Headlines. Projects and Activities.	6 Classes
Model Construction: Proportionality & Geometric Similarity Modeling with Proportionality, Using Data to Corroborate Models, Fitting Lines Analytically and Computationally, Geometric Similarity. Projects and Activities.	6 Classes
Empirical Modeling Introduction and Context, Linearizable Models, Ladder of Transformations for One Term Models, Polynomials Models (Smoothing and Interpolation), Divided Differences, Multiple Regression. Projects and Activities.	6 Classes
Discrete Dynamical System Models (Proportionality and Empirical Blend) Introduction, Bacteria Population Model, Linear and Nonlinear Predator-Prey Models, Epidemics (SIR Model). Projects and Activities.	5 Classes
Simulation Models Introduction, Basic Examples, Modeling Random Variables, Approximating Density Functions, Queuing Models, Scheduling Models, Inventory Models. Projects and Activities.	5 Classes
Optimization Models (Construction and Selection Blend) Introduction, Linear Programming. Class Discussion and Development of models.	2 Classes

Main Types of Mathematical Models

When a mathematical model is developed, it can usually be categorized by one (or a blend) of the model types shown in the diagram below.

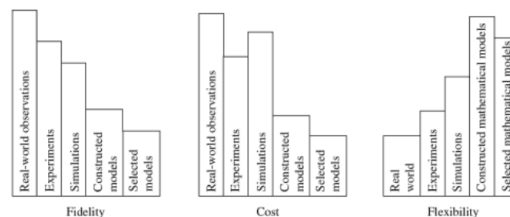
Diagram of basic model categories



Comparison of Model Types

The quality of a model can be evaluated using various criteria, including fidelity, cost and flexibility, as defined and depicted below.

- **Fidelity:** Preciseness of representation of reality.
- **Costs:** The total cost of the modeling process.
- **Flexibility:** The ability to change and control conditions affecting the model as required data are gathered.



A First Course in Mathematical Modeling, 4e, Giordano, Fox, Horton, Weir, (Cengage).

CMU STATEMENT ON SUCCESS

The faculty and staff are glad you have elected to attend Colorado Mesa University or Western Colorado Community College and want you to succeed in achieving your academic goals. The following information is shared with you to enhance the likelihood that you will be successful.

1. Attend class.

Institutional research shows that class attendance and participation are closely linked to your success as a student (i.e., the better your attendance, the better your grade is likely to be). When you are always present, you will understand the course content and how it contributes to your growth as a college student. You are required to attend this class regularly, adhering to the attendance policy established in this course syllabus by your instructor. Additionally, you should review the Attendance Policy of the institution's **Catalog** for further details on expectations. For online courses, check with your instructor and/or class syllabus for expectations delivered in that format.

2. Prepare for and participate in class.

It takes more than showing up for class to succeed. You need to be prepared to actively participate in class. Your instructor has given you a schedule of course topics for the semester, along with readings and/or activities that should be completed prior to coming to class. If you aren't clear about these expectations, talk with your instructor. In general, you should follow the 2:1 rule: two hours of study/homework time for every 1 hour of classroom time. This can vary some from week to week, but on average, most instructors will assume you are putting in the time and keeping pace with the class. So make the effort to stay current and don't leave everything to the end of the term.

By meeting deadlines and managing your time wisely, you will get much more from the class and earn higher grades. Assume that faculty members will not accept late homework and don't offer extra credit assignments. Some may – and by reviewing the syllabus you will know their policies – but instructors have no obligation to do so. A final note. If you need help with study skills, time management, note-taking and the like, consider registering for SUPP 101, a course that helps first-year students with their transition to college life.

3. Use technology to support your success.

All members of this class are expected to show respect to each other and to contribute to a positive academic learning environment of the class. Please turn off cellphones or set them to silent when you are in class. Text messaging, checking email, working on social networking sites, and performing non-class related activities on any electronic device (cell phone, laptop, iPad, etc.) is disruptive and not acceptable behavior during the class session. Check your course syllabus for the consequence of using these devices during class time.

4. Take advantage of campus resources.

We offer numerous academic support resources to help you. The staff of **Tomlinson Library** can assist you with finding information resources either in person or online. The **Tutorial Learning Center** offers *free, walk-in* tutoring for a wide variety of subjects. Maybe it's just a math problem that's not making sense, or perhaps having a peer take a look at your assignment is what you need. The TLC can help with the smallest issue or provide you with tutoring if you have a particularly challenging course. Get help before a small problem becomes a big one. Stop by and see the services they offer, most of which are provided by other students. If your semester gets a little overwhelming, contact the **Office of Student Services** for assistance. Need to engage in some activity outside of classes? Stop by the **Maverick Center** for a good workout, or find students with some similar interests by joining a **student club**.

5. Build relationships with your instructors, advisor, and other students.

a. Your best guidance for success will come from your instructors, and research tells us that your interactions with faculty members is the most important determinate in college success. Instructors genuinely want you to be successful and will do what they can to help you reach your goals. Locate their contact information on the syllabus and store that information in your phone. Each instructor keeps office hours that they set aside to meet with students. If you cannot meet during their office hours, schedule an appointment in advance.

b. Plan to meet with your advisor at least once a semester. At a minimum, consult with your advisor on your schedule for the next semester before registration opens. Popular required courses fill quickly, so if you delay registration, you might not get your preferred courses and could possibly delay your graduation. Advisors provide valuable assistance in determining which courses you need to take for your degree and the best order to take courses. Advisors can also direct you to the most appropriate networks when you are in need of assistance.

If you do not know the name of your advisor, log into MAVzone and click on Student Academics tab. Scroll down the Academic Profile column to Advisors; directly email your advisor by clicking on envelope icon.

c. Connect with other students in all your classes. You and your peers have similar goals and will face similar challenges; this can help you feel less alone in solving problems. Being active in a study group can enrich your understanding of course materials and can provide extra motivation and support to succeed. Learn more about the value of creating a study group at *Fight for First Year in College: Form Study Groups* at http://www.academictips.org/acad/first_year/formstudygroups.html

6. Use financial aid wisely.

Be aware that your decisions about attending class and considering whether to add or drop a class can affect your financial aid. Discuss potential changes with your advisor before making them. You must complete at least 12 credit hours each semester to be considered full-time, often a requirement to receive financial aid. Part-time students should check with the **Office of Financial Aid** for credit hour requirements. Audited classes do not count for enrollment purposes.

To retain your aid for the next term, you are required to make satisfactory academic progress toward your degree and maintain the following minimum grade point averages below. **If you receive all F's for one term, you will be suspended from financial aid and must repay all Title IV funds.**

Cumulative Credit Hours Earned	Minimum GPA
1 to 15	1.70
16 to 30	1.80
31 to 45	1.90
46+	2.00

To remain eligible to receive financial aid, students must be successfully completing 75% of classes attempted. Aid will be suspended until the student successfully increases the completion rate to 75%. Be sure to report any changes in your enrollment, residency status, or receipt of additional resources in writing to the Office of Financial Aid. Financial aid is not available if you have not graduated from your program but exceed the total undergraduate cumulative hours as show below.

Baccalaureate degree:	170 hours
Associate degree:	80 hours
One-year certificate:	40 hours

Examples of Mathematical Modeling Problems:

Annual Undergraduate Mathematical Modeling Competition (MCM)

Running from 1985 - Present



Consortium for Mathematics and Its Applications (www.comap.com)

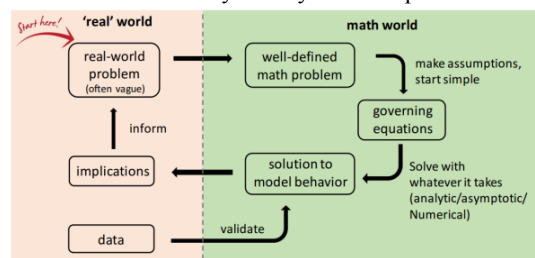
Year	Mathematical Contest in Modeling	Interdisciplinary Contest in Modeling	High School MCM
2002	Wind and Waterspray	SCRUB land too much and may lose LIZARDS	School Busing
	Airline Overbooking		The Falling Ladder
2003	The Stunt Person	Aviation Baggage Screening Strategies: To Screen or Not to Screen, that is the Question	What is it worth?
	Gamma Knife Treatment Planning		How fair are major league baseball parks to the players?
2004	Are Fingerprints Unique?	To Be Secure or Not to Be?	Motel Cleaning Problem
	A Faster QuickPass System		The Art Gallery Security System
2005	Flood Planning	Nonrenewable Resources	Modeling Ocean Bottom Topography
	Tollbooths		Gas Prices, Inventory, National Disasters, and the Mighty Dollar
2006	Positioning and Moving Sprinkler Systems for Irrigation	Trade-offs in fight against HIV/AIDS	Inflation of the Parachute
	Wheel Chair Access at Airports		A South Sea Island Resort
2007	Gerrymandering	Organ Transplant: Kidney Exchange Problem	Smoke Alarms
	The Airplane Seating Problem		Car Rentals
2008	Take a Bath	Finding the Good in Health Care Systems	National Debt and National Crisis
	Creating Sudoku Puzzles		Going Green
2009	Designing a Traffic Circle	Creating Food Systems: Re-Balancing Human-Influenced Ecosystems	Water, Water Everywhere
	Energy and the Cell Phone		Tsunami ("Wipe Out!")
2010	The Sweet Spot	Great Pacific Ocean Garbage Patch	Bicycle Club
	Criminology		Curbing City Violence
2011	Snowboard Course	Electric vehicles: environ and economically sound? Widespread use feasible and practical?	Space Shuttle Problem: No More Space Shuttles
	Repeater Coordination		Search and Find
2012	The Leaves of a Tree	Modeling for Crime Busting	American Elk
	Camping along the Big Long River		How Much Gas Should I Buy This Week?
2013	The Ultimate Brownie Pan	Network Modeling of Earth's Health	Emergency Medical Response
	Water, Water, Everywhere		Bank Service Problem
2014	Keep-Right-Except-To-Pass Rule	Using Networks to Measure Influence and Impact	Unloading Commuter Trains
	College Coaching Legends		The Next Plague?
2015	Eradicating Ebola	Managing Human Capital in Organizations	Preventing Road Rage
	Searching for a lost plane	Is it sustainable?	City Crime and Safety
2016	Hot Bath	Measuring the Evolution and Influence in Society's Information Networks	Swim, Bike, and Run
	Space Junk	Are we heading towards a thirsty planet?	Shop and Ship
2017	The Goodgrant Challenge	Modeling Refugee Immigration Policies	
	Managing The Zambezi River	Optimizing the Passenger Throughput at an Airport Security Checkpoint	Drone Clusters as Sky Light Displays
	Merge After Toll	Sustainable Cities Needed!	Ski Slope
	"Cooperate and navigate"	Migration to Mars: Utopian Workforce of 2100	

The Mathematical Modeling Process:

1. Identify the problem.
What is it that you want to do or find out? This is often a difficult since real-world situations are often described in vague and general terms.
2. Make assumptions.
Real-world situations are often too complicated to completely describe mathematically. Often you need to reduce the complexity of the problem by making simplifying assumptions.
 - (a) Identify and classify the variables.
What influences the behavior identified in Step 1? What measurable quantities are involved? Determine which are independent variables and which are dependent.
 - (b) Determine interrelationships between the variables and submodels.
Find equations or other mathematical representations that relate the variables.
3. Solve the model.
Perform whatever mathematical steps that are required to produce solutions out of the model. You may need to go back to Step 1 or 2 after you see how this step is going. Note that the model is typically not the solution; rather the model is an idealized representation of the phenomena. What solutions we obtain out of the model in this step can depend on the context.
4. Verify the model.
 - (a) Does it address the problem?
 - (b) Does it make common sense?
 - (c) Test it with real world data.
5. Implement the model.
Make sure the model is user-friendly. Make it as easy as possible to input the data and interpret the output. Graphics are often helpful in the output. Communicate the model effectively for the model users.
6. Maintain the model.
Things change. Re-evaluate the assumptions made earlier in the modeling process. Can you improve the model by taking more variables into account?

Diagram of Modeling Process

Note that a model may or may not incorporate data.



http://www.vcyang.com/files/Model_flowchart/math_model_flowchart.pdf

Writing a Modeling Report

<https://www.immchallenge.org.au>



Models are designed to address particular problems in specific situations. Thus models must be capable of being evaluated and used by others, including non-mathematicians. Information needs to be communicated clearly and fully. Reports on mathematical models vary in style and detail, but should always contain information that gives a complete picture of what the modelling has achieved.

Report writing checklist

A checklist for a good report may include:

- ☐ **Describing** the real-world problem being addressed.
- ☐ **Specifying** resulting mathematical questions precisely.
- ☐ **Listing** all assumptions and their justification.
- ☐ **Indicating** sources of imported information (for example, websites).
- ☐ **Explaining** how numerical values used in calculations were decided on.
- ☐ **Showing** and justifying all mathematical work.
- ☐ **Setting out** all mathematical work, graphs, tables, etc.
- ☐ **Interpreting** mathematical results in terms of real-world problem.
- ☐ **Evaluating** the result. Does your answer make sense? Does it help to answer the problem?
- ☐ **Dealing with** refinements to the original problem.
- ☐ **Qualifying** the solution.
- ☐ **Recommending** the solutions arising from the work. What further work is needed?

In practice, several of these activities can occur at the same time. For example, obtaining a mathematical result, interpreting it, and evaluating its correctness or relevance, are aspects that are often dealt with together.

Report summary checklist

Writing reports is not easy. It takes a great deal of practice to produce reports of value. The mathematics and the modelling should not be the focus of the report. The mathematics and modelling are the means to an end. The focus of the report should be a solution to the real-world problem. The 2016 IM²C required participants to submit a one-page summary sheet and a solution of up to 20 pages. A well-written summary is vital. Consider it a direct statement to the people who needed to solve the real-world problem.

The summary should:

- ☐ State the problem
- ☐ State the assumptions made
- ☐ Give a brief description of the mathematics used
- ☐ Provide practical suggestions to solve the real-world problem being modeled.

The summary might also discuss what might have been done to develop the solution further on another occasion.

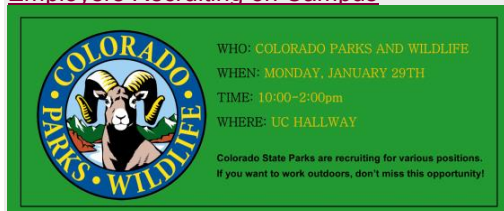
CMU Career Services: Upcoming Events

<http://www.coloradomesa.edu/career/events.html>

Find out more about career fairs, workshops, employer visits and other events.



Employers Recruiting on Campus



Workshops

Register for workshops with Career Services at career@coloradomesa.edu.

SPRING SEMESTER 2018:

Choosing a Major Workshop, Feb. 1, 4:00 – 5:00, UC 222
 Building Your Profile in Handshake, Feb. 8, 3:30 – 4:30, DH 204
 Resume and Cover Letter Workshop, Feb. 12, 5:00 – 6:30, DH 111
 Resume and Cover Letter Workshop, Feb. 13, 4:00 – 5:30, DH 111
 Interviewing Skills Workshop, Feb. 21, 3:30 – 4:30, UC 221
 Job Search Strategies Workshop, Mar. 7, 3:30 – 4:30, UC 221
 Resume and Cover Letter Workshop, Apr. 5, 3:30 – 5:00, UC 222
 Interviewing Skills Workshop, Apr. 11, 4:00 – 5:00, UC 221
 Preparing for an Internship, Apr. 18, 4:00 – 5:00, EH 101
 Employment Readiness Boot Camp, Apr. 24, 3:30 – 5:30, UC 222

Workshop dates and times subject to change. Please visit this page often and watch your MAVzone email for updates about upcoming workshops!

2018 Spring Career Connections Fair

Colorado Mesa University Center – Meyer Ballroom,
 March 1, 2018, 9am – 2 pm.

	Company Name	City	Webpage
1	Aspen Skiing Company Hospitality	Aspen	www.aspensnowmass.com/jobs
2	Brannan Companies	Denver	www.brannan1.com
3	Buckle, Inc.	Kearney	www.buckle.com
4	Bureau of Land Management - Vernal	Vernal	www.blm.gov
5	Capital Books and Wellness	Grand Junction	www.capitalbooksandwellness.com
6	City of Lakewood - Police Department	Lakewood	joinlakewoodblue.com
7	Coburn Investigation Agency	Woodland Park	www.cia007.com
8	Colorado Department of Transportation	Denver	www.codot.gov
9	Colorado Mesa University	Grand Junction	www.coloradomesa.edu
10	Deer Valley Resort	Park City	www.jobs.deervalley.com
11	Eagle River Water and Sanitation District	Vail	www.erwsd.org
12	Family Health West	Fruita	www.fhw.org
13	Glenwood Host Springs	Glenwood Springs	www.hotspingspool.com
14	J.G. Management Systems, Inc. (JGMS)	Grand Junction	www.jgmsinc.com
15	KREX-TV5	Grand Junction	www.westernslopenow.com
16	La Villa Grande Care Center	Grand Junction	www.lavillagrandecarecenter.com
17	Lowe's Home Improvement	Grand Junction	www.careers.lowes.com
18	MBC Grand Broadcasting	Grand Junction	www.mbcgrandbroadcasting.com
19	McCarthy Building Companies	Phoenix	www.mccarthy.com
20	Mesa County Workforce Center	Grand Junction	http://mcwfc.us/
21	Metropolitan State University - Master of Health Admin	Denver	www.msudenver.edu/mha
22	Northwestern Mutual - Colorado Springs	Colorado Springs	www.coloradosprings.nm.com
23	Nuclear Care Partners	Grand Junction	www.nuclearcarepartners.com
24	Peace Corps	Oakland	www.peacecorps.gov
25	PeopleCare Health Services	Delta	www.peoplecarehs.com
26	Primary Care Partners	Grand Junction	www.pcpvj.com
27	Rocky Mountain Health Plans	Grand Junction	www.rmhp.org
28	The Daily Sentinel	Grand Junction	www.gjsentinel.com
29	University of Colorado - College of Nursing	Aurora	www.nursing.ucdenver.edu
30	Vistana Signature Experiences	Scottsdale	www.vistana.com/careers
31	West Star Aviation	Grand Junction	www.weststaraviation.com
32	Western Filament, Inc.	Grand Junction	www.wfilament.com

Planning Calendar

Spring 2018

	Monday	Tuesday	Wednesday	Thursday	Friday
1	15-Jan	16-Jan	17-Jan	18-Jan	19-Jan
2	22-Jan	23-Jan	24-Jan	25-Jan	26-Jan
3	29-Jan	30-Jan	Add/Drop Date 31-Jan	365 Quiz 1 1-Feb	2-Feb
4	5-Feb	6-Feb	7-Feb	8-Feb	9-Feb
5	12-Feb	13-Feb	14-Feb	365 Quiz 2 15-Feb	16-Feb
6	19-Feb	20-Feb	21-Feb	Math Extravaganza 22-Feb	23-Feb
7	26-Feb	27-Feb	28-Feb	Career Fair 1-Mar	2-Mar
8	5-Mar	6-Mar	7-Mar	365 Quiz 3 8-Mar	9-Mar
9	12-Mar	13-Mar	14-Mar	15-Mar	16-Mar
10	19-Mar	20-Mar	Withdraw Date 21-Mar	22-Mar	23-Mar
11	26-Mar	27-Mar	28-Mar	29-Mar	30-Mar
12	2-Apr	3-Apr	4-Apr	365 Quiz 4 5-Apr	6-Apr
13	9-Apr	10-Apr	11-Apr	12-Apr	13-Apr
14	16-Apr	17-Apr	18-Apr	19-Apr	Student Showcase 20-Apr
15	23-Apr	24-Apr	25-Apr	365 Quiz 5 26-Apr	27-Apr
16	30-Apr	1-May	2-May	3-May	4-May
17	7-May	8-May	9-May	Final 8-10 am 10-May	11-May